Math 102: Mathematics for Liberal Arts
Students
Instructor’s Syllabus

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Abstract
This document aims to set the goals for Math 102 by specifying a more detailed and flexible syllabus.

1 Catalog description
In Summer 2006, the catalog description of Math 102 was changed. It now reads:

“For students whose primary interest is neither engineering nor science; promotes the understanding of mathematical thinking in a variety of topics, including common real-world problems; uses puzzles and experiments to motivate the material. Topics include probability, statistics, and/or other topics chosen by the instructor.

Prerequisite: MTH 020 or score of xxx the CUNY proficiency/placement exam.”

2 Aims of the course
There are two meta-aims:

- introduce math that is not formula driven,
• introduce math that is relevant to non-scientists.

If there are a couple of students interested in math (or science) at the end of the term, and a dozen or so who understand how someone else could be interested, then the course should be considered a success.

More practically, students leaving this course should have basic numeracy (the ability to do arithmetic with a calculator and to do rough estimation). They should have some competence in writing mathematical statements (avoiding pronouns and open grammar). They should understand the concept of algorithm.

The MAA (Mathematical Association of America) has recently studied successful undergraduate programs and their “best practices.” On the advice of their report, available at

http://www.maa.org/cupm/

we are expanding the use of technology (in the form of web-based applets and quizzes) and writing assignments. Also, we encourage individual instructors to allow their students to practice speaking aloud about mathematics. This may take the form, for example, of having a star student explain a topic, or by having the students work through a worksheet in small groups.

3 The students

Approximately 1000 students take Math 102 every year, and for most of them (how many?) this is their last contact with the mathematics department.

In my experience, the students belong to three castes. The lowest caste is incapable of adding fractions or solving the equation $4 + c = 3$. Typically, this caste also seems to have difficulty attending class or doing homework, and seems to have exceptionally vulnerable health during scheduled exams. The middle caste is interested and has basic math skills, but a short attention span. Members of this caste are destined to pass this course and may even earn an A. The highest caste, about 10% of my students, is both able and extremely interested in learning. These students deserve to be challenged and exposed to interesting math: their interests are outside of science but this may be an error of misinformation or youth.

Instructors are encouraged to poll their class by distributing a non-anonymous questionnaire. Questions may include
• What is your major?
• When did you start your first college course?
• What are you hobbies?
• Do you have credit for Math 030?
• Do you follow politics at all?
• How often do you read a newspaper?
• Best guess: how many people alive today?

4 Syllabus

The syllabus is divided into several “modules”. Instructors are strongly encouraged to include the modules on

• Probability,
• Statistics,
• the COMPASS exam.

The remaining course time is to be spent on additional topics following the tastes of the instructor and students.

More information on the modules is provided below.

In recent years, the grade distribution has been roughly

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<th>B-</th>
<th>C+</th>
<th>C-</th>
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5 Exam Policies

Exam and homework policies vary wildly from instructor to instructor. In the interest of creating such a bank of problems, I propose the following guidelines for exams.
• The first page of the exam should contain the date of the exam, the name of the module that the exam covers, the name of the instructor, space for the students name and ID number, and a statement of the ground rules for the exam (including the time allowed for the exam). The first page should not contain any problems.

• Standard ground rules: Students are allowed to use calculators, but not cell-phones. Students should remove sunglasses and brimmed hats. Students should use a pencil, not a pen. Students should not confer with one another. Any questions asked during the exam must be asked before any students have left, so students should look through the exam early in the period.

• The value of each problem (number of points) should be clearly labeled on the exam.

• At some point after the exam has been graded, the instructor should provide a copy of the exam (please improve any rough spots that surfaced during the test period or during grading) to the main office for storage in the exam bank.

6 List of Modules

The proposed modules include the following. At this point, few of these have been created. If you want to create one, please send email to obryant@gmail.com. If you have an idea for one that is not listed here, or ideas about one that is listed, please send email to obryant@gmail.com.

• Probability (counting, independence, uniform distribution, genetics, paradoxes)

• Statistics (averages, dispersion, normal distribution, z-statistics)

• Voting and Apportionment (Alabama paradox, Ranked preference voting systems)

• Graphs (Euler cycles, Hamiltonian cycles, planarity)

• Numeration systems (base-b number systems, Modular arithmetic)
• mth 030 (linear equations, ratios and percents)
• Sequences (recognize a sequence of numbers, Fibonacci numbers, golden ratio)
• tiling (?)
• Sudoku
• Geometry (area, volume)
• Finance (simple interest, compound interest)
• COMPASS exam (reading graphs)
• Infinities (countable, uncountable, diagonalization)
• Cryptography (Caesar, Monoalphabetic, Vigenere, index of coincidence, frequency analysis)